CLAIMS

1. A method for removing impurities in a physiologically active protein-containing sample, which comprises the steps of:

1) forming the physiologically active protein-containing sample into an aqueous solution of low conductivity as well as a pH equal to or lower than the isoelectric point of the physiologically active protein; and

2) removing the resulting particles.

2. The method according to claim 1, wherein the aqueous solution of low conductivity has a conductivity of 0 to 100 mM, as expressed in molarity.

3. The method according to claim 1 or 2, wherein the aqueous solution of low conductivity has an ionic strength of 0 to 0.2.

4. The method according to any one of claims 1 to 3, wherein the aqueous solution of low conductivity has a conductivity of 0 to 300 mS/m.

5. The method according to any one of claims 1 to 4, wherein the aqueous solution is selected from aqueous solutions of hydrochloric acid, citric acid and acetic acid.

6. The method according to any one of claims 1 to 5, wherein the pH of the aqueous solution is equal to or lower than the isoelectric point of the physiologically active protein and equal to or higher than pH 2.0.

7. The method according to any one of claims 1 to 6,

wherein the impurities are DNA contaminants.

8. The method according to any one of claims 1 to 6, wherein the impurities are viruses.

9. The method according to claim 7, wherein the physiologically active protein-containing sample has the DNA contaminants at a DNA concentration of 22.5 pg/ml or less after the treatment of removal of DNA contaminants.

10. The method according to any one of claims 1 to 9, wherein the physiologically active protein is an antibody.

11. The method according to claim 10, wherein the antibody is an IgG antibody.

12. The method according to claim 10 or 11, wherein the antibody is a humanized monoclonal antibody.

13. The method according to claim 12, wherein the antibody is a humanized anti-IL-6 receptor antibody.

14. The method according to claim 12, wherein the antibody is a humanized anti-HM1.24 antigen monoclonal antibody.

15. The method according to claim 12, wherein the antibody is a humanized anti-parathyroid hormone-related peptide antibody (anti-PTHrP antibody).

16. The method according to any one of claims 1 to 9, wherein the physiologically active protein is granulocyte colony-stimulating factor.

17. The method according to any one of claims 1 to 16, wherein the particles are removed by filtration through a filter.

18. The method according to claim 1, wherein step 1) is

accomplished by forming the physiologically active protein-containing sample into an acidic or alkaline aqueous solution of low conductivity, and adjusting the resulting sample with a buffer to a pH equal to or lower than the isoelectric point of the physiologically active protein.

19. The method according to claim 1,

wherein the physiologically active protein is an antibody, and

wherein step 1) is accomplished by subjecting the antibody-containing sample to affinity chromatography on Protein A or G, eluting the sample with an acidic aqueous solution of low conductivity, and adjusting the resulting eluate with a buffer to a pH equal to or lower than the isoelectric point of the antibody.

20. The method according to claim 18 or 19, wherein the buffer is an aqueous solution of Tris.

21. A purified physiologically active protein obtainable by the method according to any one of claims 1 to 20.

22. A method for manufacturing a medical protein formulation, which comprises a purification step in which the method according to any one of claims 1 to 20 is used.